

Supporting information

The behavior of conductivity dynamic modulus and its connection to thermodynamic bulk modulus in ionic liquids

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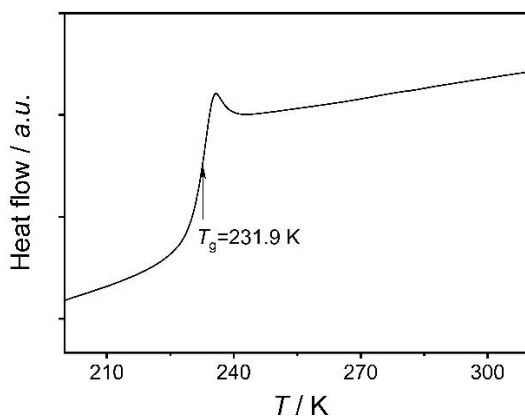


Fig. S1: DSC scan of BMPyr BOB at ambient pressure. The glass-transition temperature of BMPyr BOB is equal to 231.9 K.

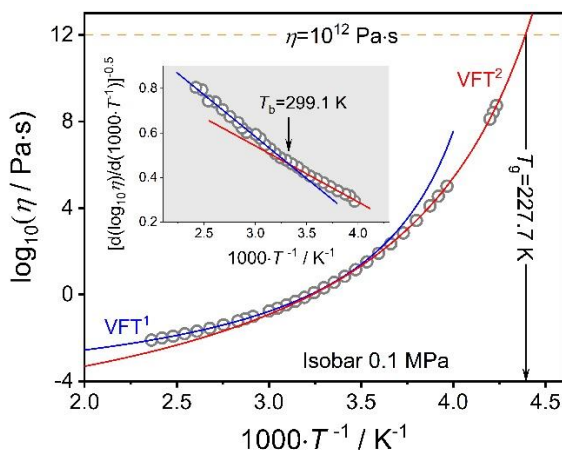


Fig. S2: $\log_{10}\eta$ as a function of $1000 \cdot T^{-1}$ at 0.1 MPa for BMPyr BOB; Solid lines denote the fits of VFT equation ($\log_{10}\eta = \log_{10}\eta_0 + \log_{10}e \cdot D T_0 / (T - T_0)$) with parameters: $\log_{10}\eta_0 = -3.78 \pm 0.02$ Pa s, $D = 3.57 \pm 0.06$, $T_0 = 219.89 \pm 0.76$ K (VFT¹); $\log_{10}\eta_0 = -5.35 \pm 0.05$ Pa s, $D = 7.58 \pm 0.08$, $T_0 = 191.40 \pm 0.29$ K (VFT²). Inset: Stickel plot for tested IL.

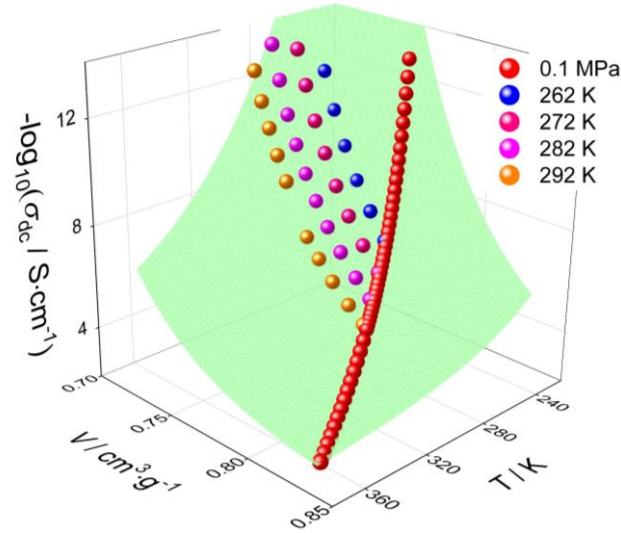


Fig S3: 3D plot of $-\log_{10}\sigma_{dc}$ vs. T , V for BMPyr BOB. The surface is the fit of Avramov model with the parameters: $A=1.92\pm 0.06$ S cm^{-1} , $B=136.97\pm 1.34$, $D_0=3.36\pm 0.05$, and $\gamma=4.19\pm 0.03$.

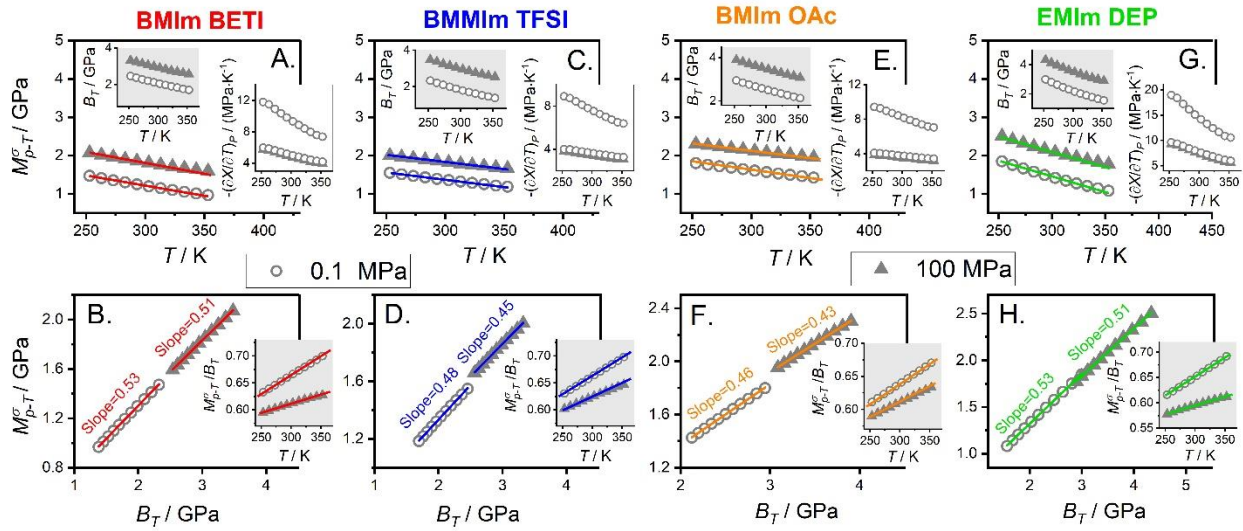


Fig. S4: The behavior of dynamic modulus and its connection to bulk modulus at isobars: 0.1 and 100 MPa for BMIm BETI (planes A and B), BMMIm TFSI (planes C and D), BMIm OAc (planes E and F), and EMIm DEP (planes G and H).

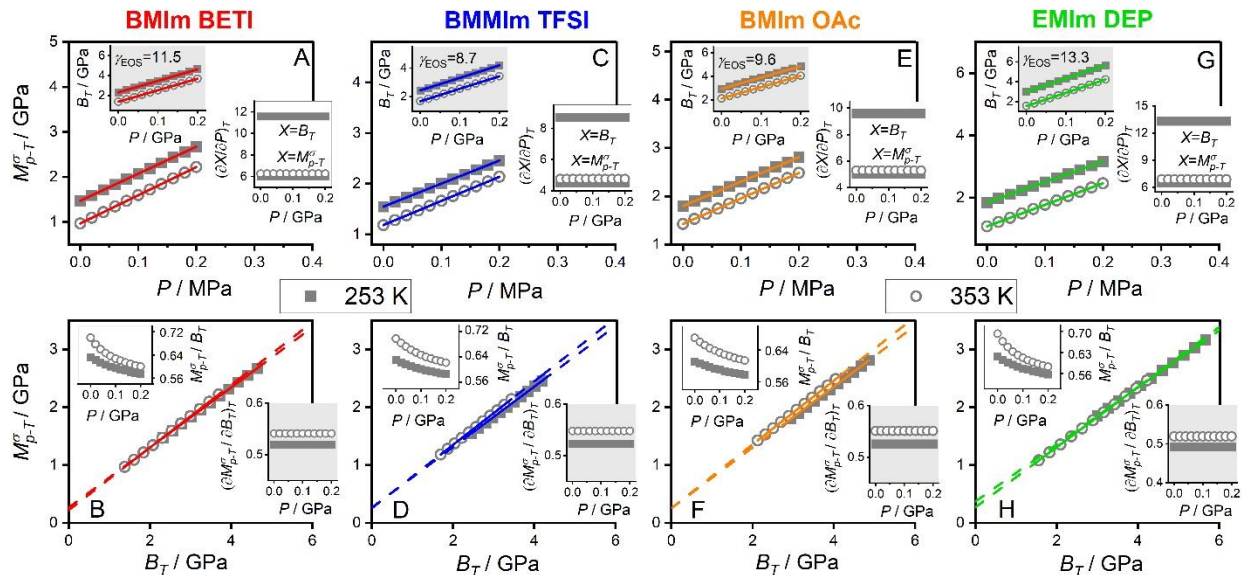


Fig. S5: The behavior of dynamic modulus and its connection to bulk modulus at isotherms: 253 and 353 K for BMIm BETI (planes A and B), BMMIm TFSI (planes C and D), BMIm OAc (planes E and F), and EMIm DEP (planes G and H).

Table S1.

| | γ | γ_{EoS} | T_g / K | T_b / K | $(dM_{p-T}^\sigma/dB_T)_P$ (isobar 0.1 MPa) | $(dM_{p-T}^\sigma/dB_T)_P$ (isobar 100 MPa) | $(dM_{p-T}^\sigma/dB_T)_T$ (isotherm 253 K) | $(dM_{p-T}^\sigma/dB_T)_T$ (isotherm 353 K) |
|------------|-----------|----------------|--|--|--|--|--|--|
| BMPyr BOB | 4.19±0.03 | 9.7±0.1 | 227.9 ^σ 227.7 ^η | 298.6 ^σ 299.1 ^η | 0.29 | 0.28 | 0.30 | 0.32 |
| BMIM BETI | 2.85±0.05 | 11.5±0.2 | 190.4 | - | 0.53 | 0.51 | 0.52 | 0.54 |
| BMMIm TFSI | 2.75±0.05 | 8.7±0.1 | 191 ^σ 195 ^{DSC} | 285.7 ^σ 276 ^η | 0.48 | 0.45 | 0.52 | 0.55 |
| BMIM OAc | 2.25±0.05 | 9.6±0.1 | 200 ^σ 203.5 ^{DSC} | 257 | 0.46 | 0.43 | 0.53 | 0.55 |
| EMIm DEP | 2.15±0.03 | 13.3±0.2 | 202.7 | - | 0.52 | 0.49 | 0.53 | 0.51 |